

**REMARKS*****Status of the Claims***

Claims 1-10 are pending, with claim 1 being independent. Without conceding the propriety of the rejections, claims 5 – 7 have been amended to even more clearly recite and distinctly claim the present invention. No new matter has been added.

Applicants respectfully request the Examiner to reconsider and withdraw the outstanding rejections in view of the foregoing amendments and the following remarks.

***Claim Rejections under 35 U.S.C. § 112***

Claims 5-7 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. The Examiner states that it is unclear whether the percentage of methane is based on weight or mole or volume. Without conceding the propriety of the rejections, claims 5-7 have been amended to recite weight %, thereby obviating the rejection. Accordingly, withdrawal of the rejection under 35 U.S.C. § 112, second paragraph, is respectfully requested.

***Claim Rejections under 35 U.S.C. § 103(a)***

Claims 1-5 and 8-10 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over USPN 4,622,308 (“Koikeda”) in view of USPN 4,502,945 (“Olbrich”) further in view of GB 975,454 (“GB”). Applicants respectfully disagree with the rejections; therefore, the rejections are traversed.

Koikeda relates to a catalyst suitable for use in the production of hydrocarbons from synthesis gas comprising an iron-containing Fischer Tropsch catalyst, a zeolite, and at least one metal selected from the group consisting of ruthenium, rhodium, platinum, palladium, iridium, cobalt, and molybdenum. As explained in the present Specification, reacting syngas over a catalyst mixture comprising a Fischer Tropsch catalyst component and a zeolite component to produce light olefins and iso-olefins, as disclosed in Koikeda, produces large amounts of methane and thus, Koikeda results in the formation of relatively high amounts of methane. (Page 2, Paragraph [0006]) and Page 9, Paragraph [0035]). Koikeda discloses that the catalyst increases the yield of gasoline and branched paraffins or olefins. (Col. 4, lines 14-16).

Olbrich relates to a process for producing olefins from normal paraffins and slightly branched paraffins by contacting a feed of the paraffins with an intermediate pore size zeolite.

GB discloses that isoprene is obtained by dimerizing propylene to 2-methylpentene-1 in the presence of a catalyst of the formula  $\text{Me(R)}_n$ , where Me is aluminium, gallium, indium or beryllium of valency n and R is hydrogen, alkyl or aryl, and cracking the 2-methylpentene-1 in the presence of bromine or a bromine-producing compound.

In contrast, the presently claimed invention relates to an *integrated* process for preparing high value products from a Fischer-Tropsch process with minimal production of low value products, including methane. In one embodiment, the presently claimed invention relates to an *integrated* process for preparing iso-olefins from syngas comprises subjecting syngas to *low temperature* Fischer-Tropsch reaction conditions in the presence of a Fischer-Tropsch catalyst to form a hydrocarbon product stream comprising substantially *waxy products*. The *waxy products* are isolated from the hydrocarbon product stream. The *waxy products* are subjected to an olefin-selective paraffin cracking process to form  $\text{C}_{3-5}$  olefins, and the  $\text{C}_{3-5}$  olefins are oligomerized to form a hydrocarbon product comprising iso-olefins.

According to the present invention, an integrated process comprising a low temperature Fischer Tropsch reaction followed by an olefin-selective paraffin cracking process, preferably in a Paragon reactor, may be used to efficiently and economically produce iso-olefins. The presently claimed integrated process advantageously produces these high value products while producing minimal amounts of methane.

Low temperature Fischer Tropsch synthesis is distinguished from the broader Fischer Tropsch synthesis by selection of the operating temperature. (Page 14, Paragraph [0057]). Performing a Fischer Tropsch process under *low temperature* reaction conditions produces a hydrocarbon product stream comprising *substantially waxy products* and minimal amounts of methane. (Page 8, Paragraph [0033]). A waxy product is one boiling above 600°F, preferably above 650°F. The waxy products are generally  $\text{C}_{20+}$  products, with decreasing amounts down to  $\text{C}_{10}$  and as such are too heavy and have

too high of a pour/cloud pint to be included in a distillate fuel. (Page 6, Paragraph [0026]).

The product stream from the low temperature Fischer Tropsch reaction comprising substantially waxy products and minimal amounts of methane provides a superior feed for a Paragon reactor. A Paragon reactor may operate more efficiently and economically with minimal amounts of methane in the feed to the reactor. Accordingly, although the integrated processes of the present invention may have more processing steps than other potential processes to form light olefins or iso-olefins, the efficiency and economic advantages outweigh the additional processing steps. (Page 9, Paragraph [0035]).

It is respectfully submitted that the process of Koikeda is significantly different than the presently claimed integrated process. As described above, Koikeda discloses a Fischer Tropsch process for producing hydrocarbons from syngas using a catalyst that comprises a combination of an iron-containing Fischer Tropsch catalyst, a zeolite, and at least one metal selected from the group consisting of ruthenium, rhodium, platinum, palladium, iridium, cobalt, and molybdenum. Also as described above, the catalyst of Koikeda increases the *yield of gasoline and branched paraffins or olefins*. As Koikeda discloses that the catalyst increases the yield of gasoline and branched paraffins or olefins, the process of Koikeda produces the desired product without additional processing step(s). In addition, it is respectfully submitted that the *gasoline* and branched paraffins or olefin products of Koikeda are significantly different than the *waxy products* of the presently claimed invention.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP § 2143.

Applicants respectfully submit that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill

in the art, to combine any feature of Koikeda and Olbrich. Koikeda produces the desired product, a gasoline fraction, from the Fischer Tropsch process using the disclosed catalyst. As Koikeda produces the desired product from the Fischer Tropsch process, Applicants respectfully submit that there is no suggestion or motivation to utilize an additional processing step. Accordingly, Applicants respectfully submit that there is no suggestion or motivation to combine Koikeda and Olbrich.

In addition, it is respectfully submitted that even if there were some suggestion or motivation to combine Koikeda and Olbrich and a reasonable expectation of success, Koikeda and Olbrich even when combined do not disclose or suggest all the claim limitations. It is respectfully submitted that Koikeda and Olbrich do not disclose or suggest subjecting syngas to *low temperature Fischer Tropsch* reaction conditions. It is also respectfully submitted that Koikeda and Olbrich do not disclose or suggest forming a hydrocarbon product stream comprising substantially *waxy products*. It is further respectfully submitted that Koikeda and Olbrich do not disclose or suggest isolating the waxy products. It is further respectfully submitted that Koikeda and Olbrich do not disclose or suggest subjecting the waxy products to an olefin-selective paraffin cracking process. Accordingly, even when combined, Koikeda and Olbrich do not disclose or suggest the presently claimed invention.

As described above, GB merely discloses obtaining isoprene by dimerizing propylene to 2-methylpentene-1 in the presence of a catalyst of the formula  $\text{Me(R)}_n$ . Accordingly, Applicants respectfully submit that GB does not disclose or suggest any features that would supplement any of the above-noted deficiencies of Koikeda and Olbrich. Therefore, even when combined, Koikeda, Olbrich and GB do not disclose or suggest the presently claimed invention.

In particular, the Examiner refers to Example 11 of Koikeda. It is respectfully submitted that the Fischer Tropsch process of Koikeda, including Example 11, is *not* a low temperature Fischer Tropsch process. Example 11 of Koikeda gave 85.9 % by weight of a *gasoline fraction* having a high octane number. In contrast, as described above, in the presently claimed invention the *low temperature Fischer Tropsch process* forms a *waxy product*. It is respectfully submitted that the *gasoline fraction* produced in Example 11 of Koikeda is *not a waxy product*.

Accordingly, for at least the above explained reasons, it is respectfully submitted that Koikeda in view of Olbrich further in view of GB do not teach or suggest the presently claimed integrated process.

Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Koikeda in view of Olbrich further in view of GB further in view of USPN 4,088,671 ("Kobylinski").

Kobylinski relates to process for the synthesis of higher hydrocarbons from the reaction of CO and hydrogen in the presence of a novel catalyst containing cobalt and ruthenium at low pressures. Kobylinski discloses that iron catalysts have the disadvantage in Fischer-Tropsch synthesis of producing unwanted CO<sub>2</sub>. (Column 1, Lines 44-46).

As described above, even if there were some suggestion or motivation to combine Koikeda and Olbrich and a reasonable expectation of success, Koikeda and Olbrich even when combined do not disclose or suggest all the claim limitations. As described above, Koikeda and Olbrich do not disclose or suggest subjecting syngas to low temperature Fischer Tropsch reaction conditions; Koikeda and Olbrich do not disclose or suggest forming a hydrocarbon product stream comprising substantially waxy products; Koikeda and Olbrich do not disclose or suggest isolating the waxy products; Koikeda and Olbrich do not disclose or suggest subjecting the waxy products to an olefin-selective paraffin cracking process.

As described above, GB merely discloses obtaining isoprene by dimerizing propylene to 2-methylpentene-1 in the presence of a catalyst of the formula Me(R)<sub>n</sub>. Accordingly, Applicants respectfully submit that GB does not disclose or suggest any features that would supplement any of the above-noted deficiencies of Koikeda and Olbrich. In addition, as described above, Kobylinski discloses synthesizing higher hydrocarbons using a catalyst containing cobalt and ruthenium. Accordingly, Applicants respectfully submit that Kobylinski does not disclose or suggest any features that would supplement any of the above-noted deficiencies of Koikeda and Olbrich. Therefore, even when combined, Koikeda in view of Olbrich further in view of GB in view of Kobylinski do not disclose or suggest the presently claimed invention.

Furthermore, Applicants respectfully submit that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine any feature of Koikeda and Kobylinski. Koikeda discloses a catalyst comprising *5 to 80% by weight of iron*, a zeolite, and *0.3 to 5% by weight of a metal selected from the group consisting of ruthenium, rhodium, platinum, palladium, iridium, cobalt, and molybdenum*. In contrast, Kobylinski discloses that *iron catalysts* have the *disadvantage* in Fischer-Tropsch synthesis of producing unwanted CO<sub>2</sub>, and discloses that the addition of *small amounts of ruthenium* to a catalyst containing a *major amount of cobalt* as the active ingredient in a hydrocarbon synthesis catalyst results in the production of a higher carbon number product having a lower olefin content in a synthesis gas process operated under normal synthesis process reaction temperatures. In addition, in process of Koikeda, the disclosed catalyst is used increasing the yield of gasoline. In contrast, Kobylinski discloses synthesizing higher hydrocarbons using a catalyst containing cobalt and ruthenium. Accordingly, Applicants respectfully submit that there is no suggestion or motivation to combine any feature of Koikeda and Kobylinski.

For at least the above explained reasons, it is respectfully submitted that Koikeda in view of Olbrich further in view of GB in view of Kobylinski do not teach or suggest the presently claimed integrated process.

Therefore, withdrawal of the rejections under 35 U.S.C. § 103(a) is respectfully requested.

### ***Conclusion***

Without conceding the propriety of the rejections, claims 5 –7 have been amended, as provided above, to even more clearly recite and distinctly claim Applicants' invention and to pursue an early allowance.

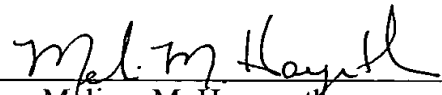
For the reasons noted above, the art of record does not disclose or suggest the inventive concept of the presently claimed invention as defined by the claims.

In view of the foregoing amendments and remarks, reconsideration of the claims and allowance of the subject application is earnestly solicited. The Examiner is invited to

contact the undersigned at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted,

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